

**NATIONAL PARK SERVICE**  
CHANNEL ISLANDS NATIONAL PARK

**TECHNICAL REPORT 06-XX**

**TERRESTRIAL VEGETATION  
MONITORING HANDBOOK  
2006**

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## Background

First created in 1938, Channel Islands National Monument was initially comprised of three islands – Santa Barbara Island, Anacapa Island, and San Miguel Island. In 1980, the Monument achieved National Park status and in 1987, Santa Rosa Island was incorporated into the park. This was followed by the acquisition of approximately 6200 acres of Santa Cruz Island in 1997 and another 8700 acres in 2000. The park's enabling legislation (PL 96-99) required the park to develop a natural resources study including 1) an inventory of all species in the park, 2) an assessment of the present conditions and probable future trends of populations, and 3) recommendations for actions that should be considered to better protect the natural resources of the park.

The park soon recognized that protection and restoration of its resources would require a permanent monitoring program. Ideally this program would help guide management of the park and assess the effectiveness of any restoration efforts.

The current terrestrial vegetation monitoring program was initially designed and implemented in 1984 but incorporated elements of earlier monitoring efforts by various researchers. Vegetation monitoring was still limited to those three islands when the original Terrestrial Vegetation Monitoring Handbook was published. The original handbook provided an overview of the program including plant communities, transect locations, monitoring protocol, and sampling methods. However, since then two

additional islands – Santa Rosa Island and Santa Cruz Island - have been incorporated into the park and there have been modifications in field methodology, data entry and analysis, and reporting. In addition, a formal review of the vegetation monitoring program in December 2000 resulted in several recommendations to further improve the program. All these factors have necessitated a revision of the original monitoring handbook.

## Monitoring Environment

Nearly all the plant vegetation communities within the park have been altered by past land use practices. Large non-native herbivores such as sheep, cattle, rabbits, horses, and burros were introduced onto the various islands beginning in the mid-1800s. Most of these animals have been removed from the islands although feral pigs, deer, and elk are still present. Non-native plant species have also been introduced onto various islands within the park either intentionally or accidentally. As a result non-native plants are a significant component of the park's flora and even dominate some of the island vegetation communities. There are nearly 800 plant taxa (including subspecies, varieties, and forms) currently known to occur on the islands in the park. Of these, almost 200 are considered non-native to California and are believed to have been introduced after initial European contact.

## *Islands*

As mentioned previously there are five islands within Channel Islands National Park. Four of the islands - Santa

Barbara, Anacapa, Santa Rosa, and San Miguel - are wholly managed by the National Park Service (NPS). The fifth island, Santa Cruz Island is divided into ownership between The Nature Conservancy (TNC) and NPS. TNC owns and manages the bulk of the island (approximately 76%) while the rest is owned by the United States and managed by NPS. The islands range in size from the smallest, Santa Barbara Island, at 260 hectares, to the largest, Santa Cruz Island, at approximately 25,090 hectares.

Island	Hectares
Santa Barbara	260
Anacapa	298
San Miguel	4047
Santa Rosa	21,853
Santa Cruz	25,090*

\*Of these hectares, approximately 6070 are managed by NPS.

Four of the five islands – Anacapa, Santa Cruz, Santa Rosa, and San Miguel, comprise what is called the northern Channel Islands. These islands are oriented along an east to west trending axis. Santa Barbara Island is considered one of the four southern Channel Islands. It is the only southern Channel Island within the Park.

### *Vegetation Communities*

In the first monitoring protocol handbook (Halvorson et al 1988), 15 plant communities were described as being representative of the vegetation found on the three islands then within the Park. These 15 communities were

divided into four broad life-form classifications – grassland/herb-land, shrub-land, introduced iceplant, and woodland.

#### Grassland/herb-land

Wild oats

Barley

Annual iceplant

#### Shrubland

Sand dunes

Sea cliff scrub

Caliche scrub

Coreopsis scrub

Coastal sage scrub

Maritime cactus scrub

Sea-blite scrub

Boxthorn scrub

Haplopappus scrub

Island chaparral

#### Introduced Iceplant

Perennial iceplant

#### Woodland

Island woodland

With the addition of Santa Rosa Island and a portion of Santa Cruz Island however, additional vegetation communities were added to the parks total. Changes have also been made to the islands' plant community nomenclature. Today the park now monitors 22 plant communities. The table below shows the original communities monitored and the present equivalent communities monitored as well as new communities brought into the park from the acquisition of Santa Cruz and Santa Rosa Islands.

Monitored plant communities

**Original**

Annual iceplant  
Boxthorn scrub  
Caliche scrub  
Coastal sage scrub  
Coreopsis scrub  
Island chaparral  
Island woodland  
Maritime cactus scrub  
Perennial iceplant  
Sand dunes  
Seablite scrub  
Seacliff scrub  
Wild oats  
Barley

**Present equivalent**

Seacliff scrub\*  
Boxthorn scrub  
Caliche scrub  
Coastal sage scrub  
Coreopsis scrub  
Island chaparral  
Mixed woodland  
Maritime cactus scrub  
Perennial iceplant  
Southern beach and dune  
Seablite scrub  
Seacliff scrub  
Valley/foothill grassland  
Valley/foothill grassland

**New communities monitored**

Baccharis scrub  
Coastal bluff scrub  
Lupine scrub  
Marsh/estuary  
Oak woodland  
Riparian  
Santa Cruz Island pine  
Shrub savannah  
Torrey pine woodland

\*Annual iceplant community has been reclassified as seacliff scrub. Iceplant is still dominant in the area.

## Community Descriptions

### Perennial Iceplant

Within the park, this community is found only on the east islet of Anacapa Island. There perennial iceplant (*Malephora crocea*) was deliberately introduced by the coast guard as an erosion control measure. It now dominates large areas on the east islet. Occasional native species such as sand-lettuce (*Dudleya caespitosa*) and gumplant (*Grindelia camporum* var. *bracteosum*) occur within these areas. Both physical removal and the use of herbicides have been used in a low-level but continuous effort to eradicate the plant from the island.

### Coastal Bluff/Sea cliff Scrub

This vegetation community is found on steep ocean cliffs, which surround portions of all the islands. Due to the inaccessibility of these bluffs this community has remained largely intact and unaffected by the grazing impacts felt on other parts of the island. The plant species, which comprise this community, are slightly different on each island and even within an island, depending on topographical parameters. Common species found within this community include: coastal sage brush, yarrow (*Achillea millefolium*), maidenhair fern (*Adiantum jordanii*), Nuttall's snapdragon (*Antirrhinum nuttallianum*), San Miguel Island locoweed (*Astragalus miguelensis*), giant coreopsis (*Coreopsis gigantea*), live forever (*Dudleya* spp.), Santa Cruz Island buckwheat (*Eriogonum arborescens*), island buckwheat (*Eriogonum grande* var. *grande*), red buckwheat (*E. grande* var. *rubescens* – on SRI) seaside daisy (*Erigeron glaucus*), golden yarrow (*Eriophyllum confertiflorum*), seaside woolly sunflower (*E. staechadifolium*), and northern island hazardia (*Hazardia detonsa*). Interestingly both *E. confertiflorum* and *E. staechadifolium* are missing on Santa Barbara Island and in their place is silver lace (*Eriophyllum nevinii*), a species endemic to the southern Channel Islands.

### Valley and foothill grassland

This is a widespread plant community and is found on all the islands. Introduced annual grasses are the most common plant species within this community, although patches of native perennial bunchgrasses - which are

dominant in some areas - do occur. This community can be found on coastal terraces and all slopes where extensive grazing has occurred. The more prevalent exotic annual grasses include rip-gut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), wild oats (*Avena fatua*), slender wild oats (*Avena barbata*), Italian rye grass (*Lolium multiflorum*), red brome (*Bromus madritensis ssp. rubens*), and foxtail (*Hordeum murinum*). Native forbs and perennial bunchgrasses also occur within this community and these species include golden stars (*Bloomeria crocea ssp. crocea*), wild hyacinth (*Dichelostemma capitatum*), gold fields (*Lasthenia californica*), tidy tips (*Layia platyglossa*), California buttercup (*Ranunculus californicus*), blue-eyed grass (*Sisyrinchium bellum*), purple needlegrass (*Nasella pulchra*), and meadow barley (*Hordeum brachyantherum ssp. californicum*). Occasionally, on Santa Cruz and Santa Rosa Islands, solitary native shrubs such as lemonade berry (*Rhus integrifolia*), manzanita (*Arctostaphylos* spp.), and oaks (*Quercus* spp.) are found in the middle of these large annual grasslands. Their presence is an indication that native shrub communities may have previously existed in those areas. On the east end of Santa Cruz Island the common occurrence of these isolated shrubs has led to the creation of a new plant community called disturbed shrub savannah. In some areas on Santa Rosa Island and San Miguel Island this grassland community has been invaded by coyote brush (*Baccharis pilularis*). As the coyote brush cover increases in these areas it may be more appropriate to classify them as baccharis scrub communities.

## Island Chaparral

Island chaparral is found on the three larger islands within the park – Santa Cruz, Santa Rosa, and San Miguel. Although similar to chaparral found on the mainland, there are some differences both structurally and floristically. Structurally, the dominant, island chaparral species are taller and more arborescent resulting in an open woodland appearance. This may be due in part to climatic differences, a lower fire frequency, or the effects of long-term, intensive grazing. Floristically, mainland manzanita and oak species are replaced by island endemic species. On SCI, this community is comprised of species such as chamise (*Adenostoma fasciculatum* var. *fasciculatum*), prostrate chamise (*A. fasciculatum* var. *prostratum*), Santa Cruz Island manzanita (*Arctostaphylos insularis*), island ceanothus (*Ceanothus arboreus*), toyon (*Heteromeles arbutifolia*), and mountain mahogany (*Cercocarpus betuloides* var. *blancheae*) among other species. Towards the east end of SCI and on the isthmus, Santa Cruz Island manzanita is replaced by McMinn's manzanita (*Arctostaphylos viridissima*). On SRI, the species that tend to occur in this community are *A. fasciculatum* var. *prostratum*, Santa Rosa Island manzanita (*Arctostaphylos confertiflora*), *H. arbutifolia*, and *Q. pacifica*. On San Miguel Island, this community is extremely depauperate. The most common plants that occur in it there are *Baccharis pilularis*, *Isocoma menziesii*, and *Lupinus albifrons*.

## Coastal Sage Scrub

The coastal sage scrub community occurs on all the islands and is more common on the southern, drier areas on each island. This community was heavily impacted by grazing on each of the islands, although some relatively large intact areas do occur on SCI and SRI. In these “intact” areas nearly impenetrable thickets of shrubs approximately 3-4 ft tall are found. Dominant species within this community include coastal sagebrush (*Artemisia californica*), island sagebrush (*Artemisia nesiotica* - on SBI), island paintbrush (*Castilleja lanata* ssp. *hololeuca*), bush sunflower (*Encelia californica*), Santa Cruz Island buckwheat (*Eriogonum arborescens*), lemonade berry (*Rhus integrifolia*), goldenbush (*Isocoma menziesii*), coastal prickly pear (*Opuntia littoralis*), black sage (*Salvia mellifera*), and Brandegee’s sage (*Salvia brandegeei* – on SRI). The heavily disturbed areas of coastal sage scrub are dominated by exotic annual grasses with occasional coastal sage scrub species scattered throughout. On SCI, coastal sage scrub intergrades with grasslands on gentle slopes with deeper soils and with island chaparral on north-facing slopes. On San Miguel Island, coastal sage scrub frequently intermixes with sea cliff scrub on the southern escarpments.

#### Southern Beach and Dune

This community occurs only on the three larger islands – Santa Cruz, Santa Rosa, and San Miguel. These dune areas are generally not as expansive as those found on the mainland due to the steep coastal bluffs, which surround most of the islands. Plant species found in these “limited” dune communities include sticky-sand verbena (*Abronia maritima*),

silver beach-bur (*Ambrosia chamissonis*), sea rocket (*Cakile maritima*), beach evening-primrose (*Camissonia cheiranthifolia* ssp. *cheiranthifolia*), salt grass (*Distichlis spicata*), California saltbush (*Atriplex californica*), and Australian saltbush (*Atriplex semibaccata*). In the more stable dune areas, the native plants: prostrate coastal goldenbush (*Isocoma menziesii* var. *sedoides*) and silver lupine (*Lupinus albifrons* ssp. *douglasii*) also occur.

#### Riparian

Perennial stream courses are found only on SCI, SRI, and SMI. The quality of the native vegetation within these stream courses can range from high to extremely depauperate. Most have been impacted to a large degree by past grazing practices. In many areas, on SCI and SRI, the native riparian plant species have been locally extirpated and non-native weedy plants and grasses occupy the riparian zone. However, even prior to the introduction of alien herbivores, these areas were probably less diverse than comparable communities on the mainland. Mainland riparian dominants such as, white alder (*Alnus rhombifolia*), sycamore (*Plantanus racemosa*), and California bay (*Umbellularia californica*) do not occur on the islands (Junak et al, 1995). The more common plant species found in the island riparian areas include California maidenhair (*Adiantum jordanii*), Agrostis viridis, sticky baccharis (*Baccharis douglasi*), rushes (*Juncus* spp.), common monkey flower (*Mimulus guttatus*), carex (*Carex* spp.), sharp bullrush (*Scirpus pungens*), and cattail (*Typha domingensis*). Woody species can also be found along permanent streams. On SCI, big-leaf

maple (*Acer macrophyllum*), arroyo willow (*Salix lasiolepis*), black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), and coast live oak (*Quercus agrifolia*) are the species that occur most frequently. On SRI and SMI, the dominant, woody tree species is arroyo willow, although elderberry (*Sambucus mexicana*) and black cottonwood also occur.

#### Bishop pine woodland

Bishop pine which occurs on Santa Cruz and Santa Rosa islands is patchily distributed along the coast as far north as Humboldt County and down into Baja California. On SCI, large occurrences of Bishop pine are found on north-facing slopes in the upper reaches of Canada Christy, near Pelican Bay, and south of China Harbor. Smaller occurrences of Bishop pine are found in the upper portion of Canada de los Sauces, on Sierra Blanca ridge, and on the south side near China Harbor. On SRI, the Bishop pine groves are less extensive and are currently in poor condition although recent recruitment and establishment of seedlings and juvenile plants has been observed. Occasional over-story species mixed within the Bishop pine community include: island ironwood (*Lynothamnus floribundus* ssp. *aspleniifolius*), coast live oak (*Quercus agrifolia*), and island oak (*Q. tomentella*). Understory species include: chamise, coyote brush, globe lantern (*Calochortus albus*), toyon, smooth mouse ears (*Hypochaeris glabra*), island deerweed (*Lotus dendroideus* var. *dendroideus*), island monkeyflower (*Mimulus flemingii*), chaparral current (*Ribes malvaceum* var. *malvaceum*), poison oak (*Toxicodendron diversilobum*), canyon sunflower

(*Venegasia carpesioides*), and the rare island barberry (*Berberis pinnata* ssp. *insularis*). This community has also been called Santa Cruz Island pine woodland.

#### Mixed Woodland

This vegetation community can be found on SCI on the north-facing slopes, ravines, and canyons, particularly at the higher elevations (Junak et al., 1995). Many of the dominant trees and shrubs in this community are endemic to one or more of the islands. Over-story species can vary from a mixture of island endemics to pure stands of oak (*Quercus* spp.) or ironwood (*Lynothamnus floribundus*). Other dominant species include toyon (*Heteromeles arbutifolia*), and island cherry (*Prunus ilicifolia* ssp. *lyonii*). The oak species found in this community are canyon live oak (*Quercus chrysolepis*), Macdonald's oak (*Quercus macdonaldii*) and island oak (*Q. tomentella*). This community intergrades with island chaparral on dry, rocky slopes while turning into savannas on the deeper soils of the flats and more gentle slopes. The current extent of the savannas may be an artifact of the islands grazing history. Understory species include bent grass (*Agrostis pallens*), coyote-brush (*Baccharis pilularis*), bedstraw (*Galium* spp.), wild-cucumber (*Marah macrocarpus* var. *major*), island monkeyflower (*Mimulus flemingii*), lemonade berry (*Rhus integrifolia*), death camas (*Zigadenus fremontii*), and California polypody (*Polypodium californicum*).

### Southern Coastal Oak Woodland

The dominant species within this community is coast live oak (*Q. agrifolia*) and it occurs on north-facing slopes and shaded canyons in the Central Valley and on the north side of the island. On the slopes, the more common understory species include toyon, wood mint (*Stachys bullata*), creeping snowberry (*Symphoricarpos mollis*), and poison oak (*Toxicodendron diversilobum*). In the canyon bottoms, common understory species include honeysuckle (*Lonicera hispidula* var. *vacillans*), manroot, blackberry (*Rubus ursinus*), milkmaids (*Cardamine californica* var. *californica*), and climbing penstemon (*Keckiella cordifolia*).

### Coastal Marsh and Estuary

Coastal salt marshes are restricted to the upper inter-tidal zone of protected shallow bays, estuaries, and coastal lagoons (Barbour and Major 1977). Within the park, coastal marsh is found only on SCI and SRI. Santa Cruz Island has small marshes or wetlands at the estuaries of several canyons including Prisoner's Harbor, Cañada de los Sauces, Cañada de Malva Real, and Scorpion Canyon. On SRI, two marshes can be found at the east-end of the island. The physical condition of these marshes is dominated by the tides and the duration of tidal flooding. At times, the more shallow estuaries may undergo periodic closure - sometimes seasonal or longer - from the ocean inlets (Barbour and Major 1977). The one species that seems to be present at all the marshes on SCI and SRI is *Distichlis spicata* or

salt-grass (Junak 1995). Other native species that can be found at one or more of the marshes include California bulrush (*Scirpus californicus*), cat tails (*Typha domingensis*), arroyo willow (*Salix lasiolepis*), sticky baccharis (*Baccharis douglasii*), seep-willow (*Baccharis salicifolia*), pickle weed (*Salicornia virginica*), sea-blite (*Suaeda taxifolia*), and California saltbush (*Atriplex californica*). Introduced exotic species also occur at one or more of the marshes or wetlands. These include Australian saltbush (*Atriplex semibaccata*), brass buttons (*Cotula coronopifolia*), kikuya grass (*Pennisetum clandestinum*), curly dock (*Rumex crispus*), and foxtail (*H. murinum*). The wetlands at Scorpion Harbor and Prisoner's Harbor on SCI were directly impacted by human activity during the ranching era. Large areas of the wetlands were filled in with off-site soil - especially at Prisoner's Harbor - and portions of the drainages feeding the wetlands were rerouted and channelized. Some of the marshes or wetlands on SCI were also extensively used by the feral sheep that once roamed the island. Since the removal of the sheep, vegetative cover, duration of flooding, and the depth of standing water has increased dramatically, especially in the estuaries on the south side of the island (Junak et al 1995).

### Coyote-brush Scrub

This vegetation community is widespread on SCI at elevations below 500 ft, where it intergrades with coastal sage scrub. According to Clark (1990), it is found primarily on moderate slopes and flats with loam to sandy clay loam soils. Beyond the coyote brush (*Baccharis pilularis*) which



characterizes the community, many species that occur in it are weedy non-native plants, particularly the annual grasses. Typical alien plant species include wild oats (*Avena* spp.), rip-gut brome (*Bromus diandrus*), soft-chess (*Bromus hordeaceus*), and red brome (*Bromus madritensis* var. *rubens*). Other herbaceous species include filaree (*Erodium* spp.), Carolina cranesbill (*Geranium carolinianum* – SCI), cutleaf geranium (*G. dissectum* – SRI), fairy mist (*Pterostegia drymariodes*), bur clover (*Medicago polymorpha*), cleavers (*Galium aparine*), and various other clovers (*Trifolium* spp.). Black mustard (*Brassica nigra*), yellow starthistle (*Centaurea solstitialis*) and fennel (*Foeniculum vulgare*), all invasive non-native plants, are also found in this community on SCI. On SRI coyote-brush scrub occurs in large patches throughout the island. It also occurs on San Miguel Island but to a much smaller extent.

#### Torrey Pine Woodland

Torrey pine is an extremely rare conifer species found only on Santa Rosa Island and on the mainland near San Diego. On Santa Rosa Island, it is confined to two groves on the northeast side of the island. Within the larger grove, Torrey pine occurs in monotypic stands but intergrades with island chaparral in some areas. Underneath the dense overstory, there is a thick duff layer with occasional annuals such as chickweed (*Stellaria media*), common sow thistle (*Sonchus oleraceus*), and ripgut brome (*Bromus diandrus*) being present. Perennial understory species include June grass (*Koeleria macrantha*), San Diego needlegrass (*Achnatherum diegoense*), and chaparral zigadene

(*Zigadenus fremontii*). Where Torrey pine intergrades with island chaparral, the overstory is more open and woody species such as toyon (*H. arbutifolia*), island cherry (*P. ilicifolia* ssp. *lyonii*), lemonade berry (*Rhus integrifolia*), and island manzanita (*A. confertiflora*) co-occur.

#### Sea-blite scrub

Within the park this community is found solely on Santa Barbara Island. It is found in limited areas in the west and north areas of the island. Typically it consists of scattered sea-blite (*Sueda taxifolia*) surrounded by annual grassland (*B. diandrus*, *B. madritensis* ssp. *rubens*, *H. murinum*, etc). Other species present include *A. intermedia*, *P. drymaroides*, and *S. oleraceus*.

#### Coreopsis scrub

Although the dominant species in this community – Coreopsis gigantea - is found on all the islands, the community type is found only on Santa Barbara Island, Anacapa Island and San Miguel Island. The overstory is composed of giant coreopsis (*Coreopsis gigantea*) while the understory is dominated by a mixture of annual grasses and herbs. These usually consist of rip-gut brome, soft chess, red brome, miner's lettuce, and fairly mist. Where this community occurs in canyons on Santa Barbara Island additional species such as coast range melic (*Melica imperfecta*), and fiesta flower (*Pholistoma auritum* var. *auritum*) can also occur.

#### Boxthorn scrub

Within the park, this community is confined to Santa Barbara Island. There

it occurs in scattered patches on the east side of the island. It is like sea-blite scrub in that the species that characterizes the community, in this case *Lycium fremontii*, is found scattered throughout a matrix of annual grassland. Associated species include rip-gut brome, red brome, soft chess, pygmy weed (*Crassula connata*), prickly lettuce, and miner's lettuce.

#### Disturbed shrub savannah

This community is thought to be an artifact of intensive grazing and occurs only on the east end of Santa Cruz Island. It is characterized by isolated large, native, woody shrubs surrounded by extensive acres of annual grassland. The remaining isolated shrubs are thought to be the remnant individuals of what once was extensive island chaparral. The remaining large native shrubs are usually lemonade berry, toyon, or island scrub oak. The grassland component is dominated by rip-gut brome or wild oats. Additional species include red brome, soft chess, prickly lettuce, fiddleneck, popcorn flower, smooth cat's ear (*Hypochaeris glabra*), and various other native and introduced herbaceous species. False brome (*Brachypodium distachyon*) is another introduced annual grass that can be found in this community. Perennial native grasses such as purple needlegrass (*N. pulchra*) and creeping wild rye (*Leymus triticoides*) also occur within the annual grassland component and even dominate some areas.

#### Caliche scrub

This community is found on the western ends of both Santa Rosa and San Miguel Islands. It occurs on calcium carbonate

soils that have been exposed by erosion. Dominant plants in this community are the prostrate goldenbush (*I. menziesii* var. *sedoides*), San Miguel locoweed (*Astragalus miguelensis*), and annual grasses – predominately rip-gut (*B. diandrus*) and red brome (*B. madritensis* ssp. *rubens*). These dominant species are similar to those found in the Isocoma scrub community but caliche scrub has a much more open character and is more depauperate in the number of species it contains.

#### Isocoma scrub

On the islands, this community is found only on Santa Rosa Island where it occurs on the north side coastal terraces. It is dominated by prostrate goldenbush but San Miguel locoweed and California saltbush (*Atriplex californica*) are also common. Meadow barley (*Hordeum brachyantherum*) and sand-dune bluegrass (*Poa douglasii*) are important grass components. This community is not currently monitored under the terrestrial vegetation monitoring program.

#### Lupine scrub

Lupine scrub is found on both Santa Rosa and San Miguel Islands on sandy soils. Silver bush lupine (*Lupinus albifrons*) or yellow bush lupine (*L. arboreus*) are the dominant shrub species. Surrounding the lupine is a matrix of annual grasses - primarily rip-gut brome, creeping wild-rye (*Leymus triticoides*) and *Carex pansa*. Other species include wild heliotrope (*Phacelia distans* and common fiddleneck (*Amsinkia menziesii* var. *intermedia*).

### Maritime cactus scrub

This community is found on Santa Barbara Island. Within the park it is characterized by the heavy presence of coastal prickly pear (*Opuntia littoralis*), tall prickly pear (*O. oricola*), or coastal cholla (*O. prolifer*). Surrounding the cactus is a mix of native and non-native annuals and perennials such as red-brome (*B. madritensis* ssp. *rubens*), wild oats (*Avena* spp.) common fiddleneck (*A. menziesii* var. *intermedia*), southern island morning glory (*Calystegia macrostegia* ssp. *amplissima*), wild-cucumber (*Marah macrocarpus* var. *major*), and little-seed muhly (*Muhlenbergia microsperma*). This community is confined primarily to the south or west facing slopes of three drainages on the island. According to Junak (1995), a stretch of the coastal bluff community on the south side of Santa Cruz Island is dominated by *O. prolifer* and resembles the maritime cactus community found on the Southern Channel Islands.

## Objectives and Design

### Rationale

In the first terrestrial vegetation monitoring handbook the purpose of vegetation monitoring was “.....to assure preservation of distinct assemblages of species and subspecies that have evolved as a result of isolation from the mainland and other islands.....and to measure natural recovery and the effectiveness of management actions to restore island vegetation.” More specifically the goals were to 1) describe the major plant communities on the islands, 2) determine the levels of natural variability, 3)

identify long-term trends with a 90% chance of detecting 40% change at the 10% significance level, and 4) show patterns and rates of change among plant communities. To achieve these goals the program combined annual transect monitoring and periodic vegetation mapping. The annual transect monitoring would detect changes within plant communities and the periodic mapping would capture changes in plant community distribution across the islands. Although these overarching goals remain essentially the same, an increase in land managed by the park, and effective decreases in budget, and staffing have necessitated changes in the monitoring program. It should also be noted that the program was not designed to monitor individual rare or invasive plant species.

### Site Selection

In 1979, vegetation maps were made for Anacapa, Santa Barbara, and San Miguel Islands, as part of the first comprehensive natural resources study of the park. The maps were made using 1:24,000 scale color infrared aerial photographs. In 1984, semi-quantitative community relevé data were collected to on Santa Barbara and San Miguel Islands as a check on the accuracy of the maps before community monitoring transects were installed. With a few minor exceptions the 1979 maps were accepted as accurate and were used as the basis for transect establishment. The transects were then located subjectively across the three islands, with the objective of representing typical examples of the island vegetation (McEachern 2001). Three years after long-term vegetation monitoring began

on the three smaller islands, Santa Rosa Island was acquired by the park. Long-term monitoring for that island began in 1990. The eastern 10% of Santa Cruz Island was purchased in 1990 and long-term vegetation monitoring there began in 1998. For Santa Rosa Island and the east end of Santa Cruz Island, vegetation maps were drawn from aerial photographs with follow-up relevé sampling to check accuracy and to describe plant community distribution and composition (McEachern 2001). Transect locations on both islands were stratified by topography but the transects on Santa Rosa Island were placed in representative examples of the major plant communities in their best condition, away from community boundaries (Halvorsen in McEachern 2001), while the locations for the transects on the east-end of Santa Cruz Island were chosen by a stratified random method (McEachern 2001).

## Field Methods

### Periodic Vegetation Mapping

Vegetation communities are to be mapped every three to five years to detect changes in plant community patterns. If monitoring shows that vegetation patterns are not changing rapidly enough, then a longer mapping period perhaps 10 years may be more appropriate. Mapping should be based on aerial photographs taken in summer. Vegetation mapping should be accomplished through interpretation of 9-inch format, false color infra-red transparencies at an approximate scale of 1:12,000 with complete stereoscopic coverage. Comparisons can then be made between previous vegetation maps

and present conditions. Any changes in plant community boundaries should be highlighted on the new vegetation map.

### Permanent Transects

A point-line intercept method is used to sample the vegetation at the transect locations (Bonham 1989). Transects are 30 meters long and data is recorded every 30 cm resulting in 100 point transects. At each point species present and the height of the tallest individual are recorded. The data collected are quantified to show species composition, species frequency, height, and percent cover.

### Schedule

Data are to be collected annually at every transect location unless peer reviewed analysis of the data suggests that less frequent monitoring would be as effective. Shortages in personnel, budget shortfalls, or inclement weather can also determine the number of transects read in a single year. For those years when transect monitoring efforts may be limited priority should be given to those islands where vegetation changes are occurring most rapidly. All sites should be monitored during the growing season, usually from mid- to late-February to mid-June. Santa Barbara Island should normally be visited first, then Anacapa, Santa Cruz, Santa Rosa, and San Miguel. It is best to follow this progression as this is usually the order in which the island vegetation begins to dry and senesce. Santa Barbara Island is farther south than the others and the vegetation tends to dry out there first. For the northern Channel Islands, as one travels from east to west,

the vegetation tends to mature later and stay greener longer.

Santa Barbara Island – There are 22 transects on this island. Some transects have not been read for several years usually because of pelican nesting. Four of the transects – 8, 9, 10, and 12 were incorporated from other monitoring efforts and are longer than 30 meters. Three of these transects – 8, 9, and 10 – have been split approximately in half and each half has been given an N or S designation. Transect 9N has not been read since 1994 because of dense cactus growth. However slides should still be taken of this transect every year. With two people, it is possible to read all the transects in one week.

Anacapa Island – Anacapa is comprised of three small islets usually referred to as East Anacapa (EAI), Middle Anacapa (MAI), and West Anacapa (WAI). Each of the islets has 5 permanent transects. Access to Middle and West Anacapa can be a problem as there is no regularly scheduled transportation to those islets. Either park transportation or the park's boat concessionaire may make a special stop upon request. In recent years, West Anacapa has been off-limits due to pelican nesting. East Anacapa is the most easily accessible of the islets. Allow 3 – 4 long days to read all 15 transects or one long day apiece for each of the islets.

Santa Cruz Island – There are currently 26 transects in place at the east end of Santa Cruz Island in the original 6000 acres purchased by the park. The terrain on SCI is rugged and can be quite steep. Access to some transects can be somewhat arduous. With the use of a

vehicle, it should take two people approximately 7-8 days to read all the transects. Without the use of a vehicle an additional week will likely be needed to read all the transects. The isthmus portion of the island (approximately 8000 acres) was donated from TNC to the park in 2000. There are 34 vegetation transects on this part of the island, which were originally established by TNC. At some point in the future some or all of these transects may be incorporated into the Park's monitoring program. Successful incorporation of these transects will probably require additional funding and personnel. Markers for these transects are located on the road-side and all are fairly close to an existing road.

Santa Rosa Island – There are 86 transects located on this island. Each transect is 30 meters long. This is the most accessible island by vehicle and most of the transects can be reached easily. Expect two people to take 3 to 5 full weeks to complete all the SRI transects, less time if only the base protocol is done, more if the tree or shrub protocol monitoring must be done.

San Miguel Island – There are 16 transects on this island. Access to them is by hiking only. Three of the transects are on the west side of the island. Hiking to the west end of the island takes approximately 2-3 hours (it is 7 miles one way) depending on your pace. With an early start, these three transects can be read in one day. Expect two people to be able to read all 16 transects in five to six days.

Although there are statistical advantages to using permanent transects there are some disadvantages that the field

monitor needs to be aware of. The stakes marking each end of the transect are susceptible to loss or damage from vandalism, animal impacts, or shifting ground surfaces. There are negative impacts associated with returning to the same site every year as the vegetation is repeatedly trampled. Transect markers have been damaged or uprooted in past by people, pigs, cattle, deer, and elk. They have also been used as scratching posts and have been bent clear to the ground on occasion. Using short stakes alleviates some of these problems but this can make locating an individual transect more difficult, especially in areas of dense vegetation. In dune areas markers have been completely covered by shifting sand. The photos taken annually at each of the transects can be helpful in relocating or re-establishing “lost” transects. All transect locations have also been GPS’ed. Accuracy of the given coordinates will vary depending on the gps unit, satellite acquisition at the time the coordinates were obtained, and land-terrain features.

## Personnel

Ideally two people should read each transect. One person must be able to identify plants to the subspecies or variety level. As this person “reads” the transect, the second person records the data. If both people are knowledgeable with the plant species, then turns can be taken in reading and recording. Transects can be read by one person using a tape recorder but this is less than ideal and at some point the “spoken” data needs to be transcribed onto a datasheet.

## Sampling Equipment and Materials

Equipment and material that will be needed to conduct the monitoring as it is currently set up includes:

- Data forms – paper or electronic format (Appendix \*\*)
- Pencils
- Tatum or clipboard
- Park species list with codes
- Taxonomic field guide
- Compass
- 3 - 50 m measuring tapes (one for the basic monitoring protocol and two for the tree or shrub monitoring protocol)
- 1m or taller measuring pole marked in 5 cm increments
- Digital camera
- Densiometer – to measure tree canopy hits
- Binoculars (can be quite helpful in locating transects)
- Plant press or plastic baggies (for unknown specimens).
- Site maps (Appendix \*\*)

## Personal Gear

- Hiking boots
- Day pack
- Rain and/or wind gear
- Sun glasses
- Hat
- Sunscreen lotion
- Flashlight
- Notebook
- Water bottles (at least 2)
- Lunch/snacks
- Gaiters (when grasses are seeding out)
- Park radio
- First aid kit

## Sampling Procedures

After locating both ends of the transect line, determine which is the A end and which is the B end (this is usually stamped on the inside edge of the stake) and run out the measuring tape from A to B. The stakes are usually set a little longer than 30 meters so make sure you have both ends identified properly. Place the tape taut and close to the ground. This ensures that the same line is read every year and minimizes movement of the tape on windy days. The following rules have been developed to ensure consistency when collecting data. For transects on slopes, always read the uphill side of the transect line; if on level ground, the transect is usually read from right to left. Exceptions will be noted on the site map page for each transect. If the transect line is in a shrub dominated community the tape should be run under the shrubs not over. This may not be practical in densely shrub covered communities. Take the measuring pole and starting at 30 cm call out the species that touch the front line of the pole at every point and the height of the tallest species that touches the line at every point. If a shrub species is hit but it is not the tallest plant at an individual point, record the height number under the Max Shrub Height category on the datasheet. In addition, call out the substrate hit for every point, not just those points that have no vegetation hits. As the reader calls out the data, the recorder writes down the information on the data sheet in the appropriate place or enters the information in the handheld computer. Species are recorded on the data sheet from lowest to tallest species. Only one

hit per species is recorded at each point. If the same species is hit more than once on a single point only record one hit for that species. Read and record the data every 30 cm until 30 meters is reached and you have 100 points. While the tape is still rolled out, photograph the transect looking from A to B and from B to A.

This step can be done prior to monitoring the transect to record an “undisturbed” view of the transect area. Record the slide number on the data sheet for each view (this step is not necessary if using a digital camera – but the digital files will need to be renamed). When taking the picture use a horizontal orientation so you get as much landscape view as possible. The current camera is a Nikon D-100 35 mm digital with a 24 – 85 mm zoom lens. Transect photos are taken with the lens set at 24 mm. The focal length used needs to be the same from year to year. This makes comparing photos from different years much simpler. For digital photo files, the nomenclature should be as follows – year\_island\_transect\_viewdirection. For transects in shrub or tree dominated habitat, follow the shrub and tree monitoring protocol as described by Tree and Shrub Community Monitoring Protocol for Channel Islands National Park, California (McEachern 2000). Generally the tree and shrub monitoring protocol is to be done every 2 years for shrub transects and every 4 years for tree dominated transects. In the comments section of the data sheet, note any outstanding or unusual features involving the transect or the surrounding vegetation community.

### Recording the data

In most years since the monitoring has been conducted the data have been

recorded on paper field sheets. In 1995 an attempt was made to record some of the data into a handheld computer device. This practice was abandoned the following year and paper data sheets were again used until 2004 when data was again entered into a handheld computer device (PalmPilot M500). It is likely that electronically recording the data will be the preferred method from this point forward. As with any method there are advantages and disadvantages with the use of electronic recording.

#### Advantages

- Reduction in paper usage
- Eliminates need for housing of field data sheets
- Small handheld is more portable than carrying around clipboard and data sheets.
- Transferring data from handheld into Access database much faster than entering data by hand

#### Disadvantages

- Handheld needs to be protected from the elements – primarily dirt and moisture
- Handheld computer may not stand up to years of rugged field use.
- Computer malfunction may lead to loss of recorded data before it can be downloaded.
- Recording data into handheld not as quick as writing on field datasheet (this could potentially be overcome with a barcode scanner set up).
- Need to have access to laptop computer to download collected data each evening.

Whether the data are entered on paper field sheets or into a handheld computer

device, they should be reviewed after each monitoring effort and at the end of the day to look for possible error entries. Errors can arise from writing down or entering the wrong code, entering the data on the wrong line, or accidentally skipping a data entry line. Reviewing the recorded data allows you to make corrections while the monitoring event is still fresh in your mind.

#### Species Identification

When monitoring at least one person needs to be familiar with island species identification. Superficial similarities between species can easily lead to misidentification especially early or late in the field season. Species should only be identified to a taxonomic level of which the identifier has high confidence. Specimens of unknown plants should be collected for later identification either by use of a floral key or by a taxonomic expert in island flora. Specimens that are to be part of the Channel Island's permanent herbarium collection should be dried and then placed in a freezer for three days to eliminate pests prior to mounting on archival herbarium sheets. The park's herbarium collection is accessioned and maintained by the Santa Barbara Botanic Garden.

#### Data Management

The collected data is stored and summarized with ACCESS software by Microsoft. The raw data is entered into ACCESS where it is stored in the raw data table. Linked tables that summarize the data have been created. Written general queries are also in place to help analyze the data. These can be modified to provide specific analyses of one island or certain plant communities.



Modification of the pre-formulated queries is done in design mode. When closing out of the query you will be prompted to save or cancel your design changes. If you will be using your redesigned query repeatedly, use the “save as” option and change the name of the query to something else. The new name should contain your name or a part thereof and a descriptive element of the query (e.g. schaney\_sprichsbi). Your name will tell other people that you are the author of the query. This may help prevent your query being accidentally deleted. These types of temporary queries proliferate quite readily and periodic housecleaning (i.e. deleting of temporary queries) is essential. The descriptive element will help you to remember the purpose of the query. New queries can also be created from scratch. If you are unfamiliar with Access, you should use the assistance of the design query wizard.

ACCESS is a table-based relational database that includes forms for entering data. There are three forms for entering data – the Sites Form, the Transect Form, and the Events Form. Transect locations and metadata are entered into the database through the “Sites” form. Any newly established transect must have its location and metadata entered before any data from that transect will be accepted. Data collected from a transect is entered through the Transects Form. An event code (A, B, C, D, etc.) is associated with each data gathering trip. These codes are recycled every year. For each event that is set up in ACCESS, the starting and ending dates of the trip, the island that was visited, and the primary collector of the trip must be entered in the Events Form.

Prior to entering into Access, the data should be proofed for errors. Once corrected and entered the data needs to be proofed again in Access to catch any transcription errors. Errors should be corrected through the form interface and not in the table itself. After the data have been checked and all errors corrected, then the “Transect Macro Summary” macro and the “Relative Frequency Generate” macros need to be run. The Relative Frequency Generate macro calculates relative frequency from the raw data table and places it in the temporary file zzRelative Frequency Summary. The Transect Macro Summary macro summarizes the vegetation data for various reports.

## **Annual Report**

Once the data have been entered and summarized they are to be presented in an annual report format. The format for the report is presented below. The purpose of the annual report is to present the data. In-depth analyses of the data looking at changes, trends, statistical significance of changes should be presented in 5 or 10 year trend analysis reports.

### **Annual report format**

1. Executive Summary
2. Table of Contents
3. Introduction
4. Park Overview
5. Transect Locations
6. Vegetation Communities sampled
7. Field year History and Observations
8. Taxonomy
9. Weather year

- 10. Recommendations
- 11. Species list
- 12. Data

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## Appendix A: Species Recorded During Monitoring by Island

### Anacapa Island

#### A

*Achillea millefolium*  
*Amblyopappus pusillus*  
*Amsinckia menziesii*  
*Artemisia californica*  
*Atriplex semibaccata*  
*Avena barbata*  
*Avena fatua*  
*Avena sp.*

#### B

*Bromus carinatus*  
*Bromus diandrus*  
*Bromus hordeaceus*  
*Bromus madritensis*  
*Bromus sp.*

#### C

*Calandrinia ciliata*  
*Chenopodium murale*  
*Coreopsis gigantea*  
*Crassula connata*  
*Cryptantha clevelandii*

#### D

*Daucus pusillus*  
*Delphinium parryi*  
*Dichelostemma capitatum*  
*Distichlis spicata*  
*Dudleya caespitosa*

#### E

*Encelia californica*  
*Eriogonum arborescens*  
*Eriogonum grande*  
*Erodium cicutarium*  
*Eucrypta chrysanthemifolia*

#### F

*Frankenia salina*

#### G

*Galium aparine*  
*Grindelia camporum*

#### H

*Hemizonia clementina*  
*Hordeum intercedens*  
*Hordeum murinum*

#### I

*Isocoma menziesii*

#### L

*Lamarckia aurea*  
*Lavatera cretica*  
*Lepidium oblongum*  
*Leymus triticoides*  
*Lotus dendroideus*

#### M

*Malephora crocea*  
*Malva parviflora*  
*Marah macrocarpus*  
*Medicago polymorpha*  
*Melilotus indicus*  
*Mesembryanthemum crystallinum*  
*Mesembryanthemum nodiflorum*

#### N

*Nasella pulchra*

#### O

*Opuntia prolifera*

#### P

*Phacelia distans*  
*Phalaris minor*  
*Poa secunda*  
*Pterostegia drymarioides*

#### S

*Sanicula arguta*

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*Silene laciniata*

*Sonchus asper*

*Sonchus oleraceus*

*U*

*Unknown grass*

*V*

*Vulpia bromoides*

*Vulpia sp.*

*Z*

*Zigadenus fremontii*

## San Miguel Island

### A

*Abronia umbellata*  
*Achillea millefolium*  
*Agoseris grandiflora*  
*Allium praecox*  
*Amblyopappus pusillus*  
*Ambrosia chamissonis*  
*Amsinckia menziesii*  
*Artemisia californica*  
*Astragalus curtipes*  
*Astragalus miguelensis*  
*Atriplex californica*  
*Atriplex coulteri*  
*Atriplex semibaccata*  
*Avena barbata*  
*Avena fatua*  
*Avena sp.*

### B

*Baccharis pilularis*  
*Bromus carinatus*  
*Bromus diandrus*  
*Bromus hordeaceus*  
*Bromus madritensis*  
*Bromus sp.*

### C

*Cakile maritima*  
*Calandrinia ciliata*  
*Calystegia macrostegia*  
*Camissonia sp.*  
*Carpobrotus chilensis*  
*Castilleja lanata*  
*Cerastium glomeratum*  
*Chenopodium californicum*  
*Cirsium occidentale*  
*Claytonia perfoliata*  
*Conyza canadensis*  
*Coreopsis gigantea*

### D

*Daucus pusillus*  
*Dichelostemma capitatum*  
*Distichlis spicata*

*Dudleya greenei*

### E

*Erigeron glaucus*  
*Eriogonum grande*  
*Eriogonum grande*  
*Eriophyllum confertiflorum*  
*Erodium cicutarium*  
*Erodium moschatum*  
*Erodium sp.*  
*Erysimum capitatum*  
*Eschscholzia californica*  
*Eschscholzia ramose*

### F

*Frankenia salina*

### G

*Galium aparine*  
*Gnaphalium bicolor*  
*Gnaphalium purpureum*  
*Gnaphalium sp.*  
*Gnaphalium stramineum*

### H

*Hordeum brachyantherum*  
*Hordeum murinum*  
*Hordeum sp.*

### I

*Isocoma menziesii*

### L

*Lactuca serriola*  
*Lamarckia aurea*  
*Lasthenia californica*  
*Lessingia filaginifolia*  
*Leymus triticoides*  
*Lotus dendroideus*  
*Lotus salsuginosus*  
*Lupinus albifrons*  
*Lupinus arboreus*  
*Lupinus bicolor*

*Lupinus sp.*

*Lupinus succulentus*

*M*

*Malacothrix incana*

*Malacothrix saxatilis*

*Marah macrocarpus*

*Medicago polymorpha*

*Melilotus indicus*

*Mesembryanthemum nodiflorum*

*N*

*Nasella cernua*

*Nasella pulchra*

*O*

*Opuntia littoralis x oricola*

*P*

*Parapholis incurva*

*Phacelia distans*

*Polypogon monspeliensis*

*Pterostegia drymarioides*

*S*

*Senecio vulgaris*

*Silene gallica*

*Sisyrinchium bellum*

*Sonchus oleraceus*

*Sonchus sp.*

*Spergularia macrotheca*

*Stellaria media*

*U*

*Unknown herb*

*V*

*Vulpia myuros*

*Vulpia sp.*

## Santa Barbara Island

### A

*Achillea millefolium*  
*Amblyopappus pusillus*  
*Amsinckia menziesii*  
*Aphanisma blitoides*  
*Artemisia californica*  
*Atriplex californica*  
*Atriplex semibaccata*  
*Avena barbata*  
*Avena fatua*  
*Avena sp.*

### B

*Bromus arizonicus*  
*Bromus diandrus*  
*Bromus hordeaceus*  
*Bromus madritensis*  
*Bromus sp.*  
*Bromus trinii*

### C

*Calystegia macrostegia*  
*Chenopodium californicum*  
*Chenopodium murale*  
*Claytonia parviflora*  
*Claytonia perfoliata*  
*Coreopsis gigantea*  
*Crassula connata*  
*Cryptantha clevelandii*

### D

*Dichelostemma capitatum*

### E

*Eriogonum giganteum*  
*Erodium cicutarium*  
*Erodium moschatum*

### G

*Galium aparine*

### H

*Hemizonia clementina*  
*Hordeum murinum*

### L

*Lasthenia californica*  
*Lycium californicum*

### M

*Malacothrix foliosa*  
*Malva parviflora*  
*Marah macrocarpus*  
*Medicago polymorpha*  
*Melica imperfecta*  
*Mesembryanthemum crystallinum*  
*Mesembryanthemum nodiflorum*

### O

*Opuntia oricola*  
*Opuntia prolifera*

### P

*Parietaria hespera*  
*Phalaris minor*  
*Pholistoma auritum*  
*Pholistoma racemosum*  
*Pterostegia drymarioides*

### S

*Sonchus oleraceus*  
*Suaeda taxifolia*

### T

*Trifolium palmeri*  
*Trifolium willdenovii*

### U

Unknown grass  
Unknown herb

### V

*Vulpia myuros*



## Santa Cruz Island

### A

*Allium* sp  
*Amblyopappus pusillus*  
*Amsinckia menziesii*  
*Arctostaphylos viridissima*  
*Artemisia californica*  
*Astragalus miguelensis*  
*Atriplex californica*  
*Atriplex semibaccata*  
*Avena barbata*  
*Avena fatua*

### B

*Bowlesia incana*  
*Brachypodium distachyon*  
*Brassica nigra*  
*Bromus carinatus*  
*Bromus diandrus*  
*Bromus hordeaceus*  
*Bromus madritensis*  
*Bromus* sp.

### C

*Calochortus albus*  
*Ceanothus arboreus*  
*Centaurea melitensis*  
*Cerastium glomeratum*  
*Cirsium occidentale*  
*Clarkia epilobioides*  
*Claytonia parviflora*  
*Claytonia perfoliata*  
*Comarostaphylis diversifolia*  
*Coreopsis gigantea*  
*Cotula australis*  
*Crassula connata*  
*Cryptantha clevelandii*  
*Cryptantha* sp.

### D

*Dichelostemma capitatum*  
*Dudleya caespitosa*  
*Dudleya* sp.

### E

*Eremocarpus setigerus*  
*Eriogonum arborescens*  
*Eriogonum grande*  
*Eriophyllum staechadifolium*  
*Erodium cicutarium*  
*Erodium moschatum*  
*Erodium* sp.  
*Eucrypta chrysanthemifolia*

### G

*Galium*  
*Galium angustifolium*  
*Galium aparine*  
*Galium nuttallii*  
*Gastroidium ventricosum*  
*Geranium carolinianum*  
*Gnaphalium californicum*  
*Gnaphalium canescens*  
*Gnaphalium* sp.

### H

*Hesperocnide tenella*  
*Heteromeles arbutifolia*  
*Hordeum brachyantherum*  
*Hordeum intercedens*  
*Hordeum murinum*  
*Hordeum* sp.  
*Hypochaeris glabra*

### L

*Lolium multiflorum*  
*Lotus argophyllus*  
*Lotus dendroideus*  
*Lotus* sp.  
*Lupinus bicolor*  
*Lyonothamnus floribundus*

### M

*Malacothrix saxatilis*  
*Marah macrocarpus*  
*Medicago polymorpha*  
*Micropus californicus*  
*Mimulus flemingii*

*N*

*Nasella pulchra*

*P*

*Pectocarya linearis*

*Phalaris minor*

*Poa annua*

*Prunus ilicifolia*

*Pterostegia drymarioides*

*Q*

*Quercus agrifolia*

*Quercus agrifolia* x *Q. parvula*

*Quercus macdonaldii*

*Quercus pacifica*

*R*

*Ranunculus californicus*

*S*

*Sanicula arguta*

*Selaginella bigelovii*

*Sidalcea malviflora*

*Silene gallica*

*Silybum marianum*

*Sonchus oleraceus*

*Spergularia macrotheca*

*Spergularia villosa*

*Stellaria media*

*T*

*Torilis nodosa*

*Trifolium microcephalum*

*U*

*Unknown grass*

*Unknown Herb*

*Urtica urens*

*V*

*Viola pedunculata*

*Vulpia bromoides*

*Vulpia myuros*

*Vulpia sp.*

## Santa Rosa Island

### A

*Abronia maritima*  
*Abronia umbellata*  
*Achillea millefolium*  
*Achnatherum diegoense*  
*Achyrachaena mollis*  
*Adenostoma fasciculatum*  
*Adiantum jordanii*  
*Agoseris grandiflora*  
*Agrostis pallens*  
*Agrostis viridis*  
*Ambrosia chamissonis*  
*Amsinckia menziesii*  
*Anagallis arvensis*  
*Arctostaphylos confertiflora*  
*Arctostaphylos tomentosa*  
*Artemisia californica*  
*Astragalus miguelensis*  
*Astragalus sp.*  
*Astragalus trichopodus*  
*Atriplex californica*  
*Atriplex semibaccata*  
*Avena barbata*  
*Avena fatua*

### B

*Baccharis douglasii*  
*Baccharis pilularis*  
*Bowlesia incana*  
*Brassica nigra*  
*Bromus arizonicus*  
*Bromus carinatus*  
*Bromus diandrus*  
*Bromus hordeaceus*  
*Bromus madritensis*

### C

*Calandrinia ciliata*  
*Calochortus albus*  
*Calystegia macrostegia*  
*Camissonia cheiranthifolia*  
*Camissonia sp.*  
*Cardamine californica*  
*Cardionema ramosissimum*

*Carex globosa*  
*Carex pansa*  
*Carex praegracilis*  
*Carex sp.*  
*Carpobrotus chilensis*  
*Castilleja exserta*  
*Castilleja lanata*  
*Centaurea melitensis*  
*Cerastium glomeratum*  
*Chaenactis glabriuscula*  
*Cheilanthes clevelandii*  
*Chenopodium californicum*  
*Cirsium occidentale*  
*Clarkia davyi*  
*Claytonia parviflora*  
*Claytonia perfoliata*  
*Conyza canadensis*  
*Cotula coronopifolia*  
*Crassula connata*  
*Cressa truxillensis*  
*Cryptantha clevelandii*  
*Cuscuta salina*  
*Cynodon dactylon*

### D

*Daucus pusillus*  
*Dichelostemma capitatum*  
*Distichlis spicata*

### E

*Eleocharis acicularis*  
*Eleocharis macrostachya*  
*Epilobium canum*  
*Equisetum laevigatum*  
*Erigeron foliosus*  
*Erigeron sanctarum*  
*Eriogonum grande*  
*Eriophyllum confertiflorum*  
*Erodium botrys*  
*Erodium cicutarium*  
*Erodium moschatum*  
*Erodium sp.*  
*Eschscholzia californica*

*F*

*Filago californica*  
*Filago gallica*  
*Frankenia salina*

*G*

*Galium*  
*Galium angustifolium*  
*Galium aparine*  
*Galium nuttallii*  
*Galium porrigens*  
*Gastridium ventricosum*  
*Geranium dissectum*  
*Gilia clivorum*  
*Gnaphalium bicolor*  
*Gnaphalium californicum*  
*Gnaphalium canescens*  
*Gnaphalium luteo-album*  
*Gnaphalium purpureum*  
*Gnaphalium sp.*  
*Grindelia camporum*

*H*

*Hainardia cylindrica*  
*Hazardia squarrosa*  
*Helianthemum scoparium*  
*Hemizonia increscens*  
*Heteromeles arbutifolia*  
*Hordeum brachyantherum*  
*Hordeum intercedens*  
*Hordeum marinum*  
*Hordeum marinum*  
*Hordeum murinum*  
*Hordeum sp.*  
*Hypochaeris glabra*

*I*

*Isocoma menziesii*

*J*

*Jaumea carnosa*  
*Juncus balticus*  
*Juncus mexicanus*  
*Juncus phaeocephalus*  
*Juncus sp.*

*K*

*Keckiella cordifolia*

*L*

*Lactuca saligna*  
*Lactuca serriola*  
*Lamarckia aurea*  
*Lasthenia californica*  
*Layia platyglossa*  
*Lepidium nitidum*  
*Lepidium sp.*  
*Lessingia filaginifolia*  
*Leymus condensatus*  
*Leymus pacificus*  
*Leymus triticoides*  
*Lolium multiflorum*  
*Lolium sp.*  
*Lolium temulentum*  
*Lomatium caruifolium*  
*Lotus dendroideus*  
*Lotus sp.*  
*Lotus strigosus*  
*Lotus wrangelianus*  
*Lupinus albifrons*  
*Lupinus arboreus*  
*Lupinus bicolor*  
*Lupinus sp.*  
*Lupinus succulentus*  
*Luzula comosa*  
*Lyonothamnus floribundus*

*M*

*Malacothrix incana*  
*Marah macrocarpus*  
*Medicago polymorpha*  
*Melica imperfecta*  
*Melilotus indicus*  
*Mesembryanthemum crystallinum*  
*Microseris douglasii*  
*Microseris heterocarpa*  
*Mimulus flemingii*  
*Mimulus guttatus*  
*Minuartia douglasii*

*N*

*Nasella cernua*  
*Nasella lepida*  
*Nasella pulchra*  
*Nasella sp.*

*O*

*Opuntia littoralis*

*P*

*Parapholis incurva*  
*Pellaea andromedifolia*  
*Pentagramma triangularis*  
*Phacelia distans*  
*Phalaris minor*  
*Pinus muricata* forma *remorata*  
*Pinus torreyana*  
*Plantago erecta*  
*Platystemon californicus*  
*Poa douglasii*  
*Poa secunda*  
*Polypogon interruptus*  
*Polypogon monspeliensis*  
*Prunus ilicifolia*  
*Pterostegia drymarioides*

*Q*

*Quercus agrifolia*  
*Quercus macdonaldii*  
*Quercus pacifica*  
*Quercus tomentella*

*R*

*Ranunculus californicus*  
*Rhus integrifolia*  
*Rubus ursinus*  
*Rumex crispus*

*S*

*Salicornia virginica*  
*Salix lasiolepis*  
*Salix sp.*  
*Salvia brandegeei*  
*Sambucus mexicana*  
*Sanicula arguta*  
*Scirpus pungens*

*Selaginella bigelovii*  
*Sidalcea malviflora*  
*Silene gallica*  
*Sisyrinchium bellum*  
*Solanum douglasii*  
*Sonchus asper*  
*Sonchus oleraceus*  
*Spergularia macrotheca*  
*Spergularia villosa*  
*Stachys bullata*  
*Stellaria media*  
*Stellaria nitens*  
*Stephanomeria virgata*  
*Stylocline gnaphalioides*  
*Stylomecon heterophylla*

*T*

*Thysanocarpus laciniatus*  
*Torilis nodosa*  
*Trifolium depauperatum*  
*Trifolium fucatum*  
*Trifolium gracilentum*

*Trifolium macraei*

*Trifolium sp.*

*Trifolium willdenovii*

*Triodanis biflora*

*Typha domingensis*

*U*

*Unknown grass*

*Unknown herb*

*Uropappus lindleyi*

*Urtica urens*

*V*

*Vaccinium ovatum*

*Verbena lasiostachys*

*Vicia americana*

*Vicia sp.*

*Viola pedunculata*

*Vulpia bromoides*

*Vulpia myuros*

*Vulpia sp.*

*Z*

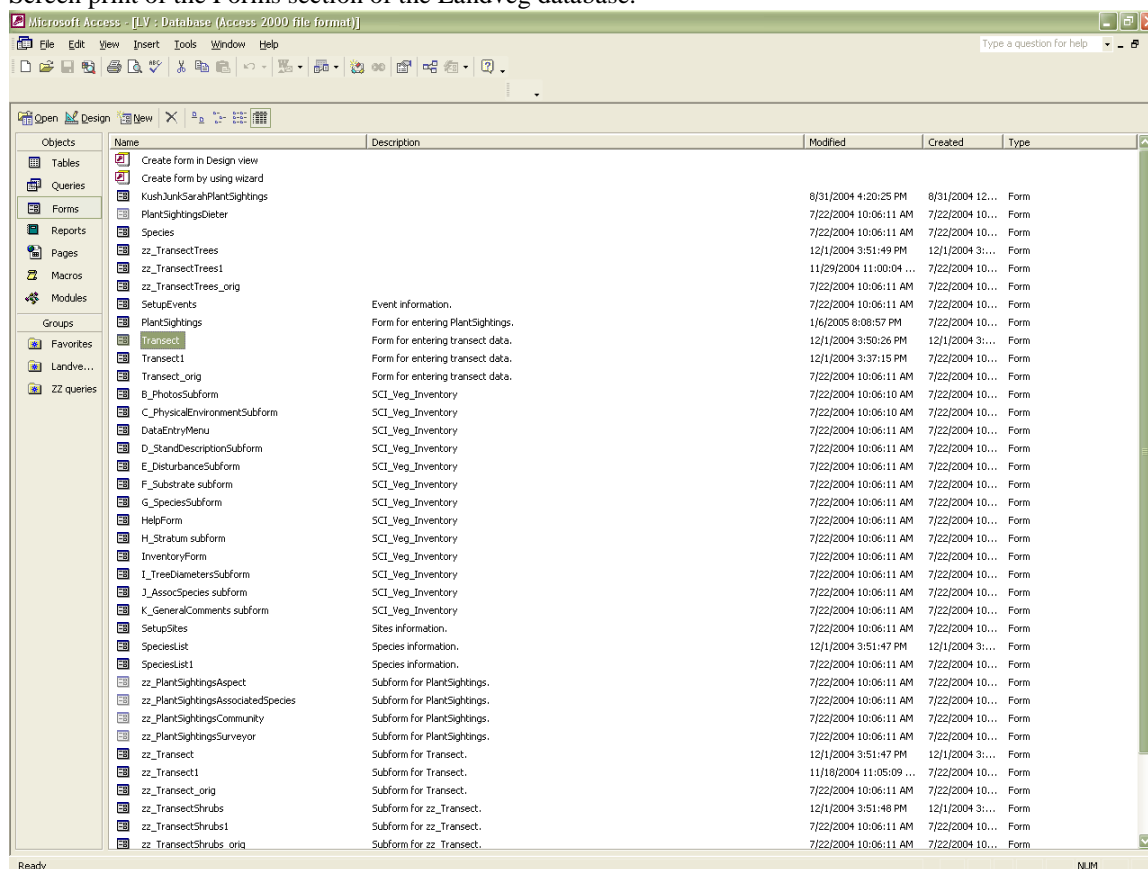
*Zigadenus fremontii*

## Appendix B: Data Management

### Forms Section

All data should be entered in the Transect form. Do not enter data directly into the raw data table. The transect form has been structured to minimize the entry of errors through the use of drop down lists. The form will not accept inappropriate entries. Entering the data directly into the raw data table bypasses these built in safeguards. The Transect form, the SetupEvents form, and the SpeciesList form are used most often with Landveg data. To access the form for entering the data, click on the forms tab on the left side menu. Double click on the form labeled transect.

Screen print of the Forms section of the Landveg database.



## Form View

This is the form where collected data is entered into the Access database. To open up the proper form to enter data for a particular transect follow the steps below.

Screen print of form for entering vegetation point-line intercept data into Access:

The screenshot shows the 'Form View' of the 'LV\_Transects' database in Microsoft Access. The form is designed for entering vegetation data. At the top, there are dropdown menus for 'Year' (set to 2005), 'Event', 'Island', and 'Transect'. To the right of these are buttons for 'Add 100 Points' and 'Open Shrubs Form'. Below these are three main data entry sections:

- Position:** Includes a 'Substrate' dropdown and a large 'Comments' text box.
- Substrates:** A table with columns 'L>H', 'Species', 'Height', and 'Dead?'. It has a record count of 1.
- Trees:** A table with columns 'SpeciesCode', 'Age', 'Tree #', 'dbh (cm)', and '# Stems'. It has a record count of 1.
- Shrubs:** A table with columns 'Position', 'Species', 'Age', 'Count', '#Stems', and 'Side of Transect'. It has a record count of 1.

Each table section includes navigation arrows and a record count (e.g., 'Record: 1 of 1'). The bottom of the window shows 'Form View' and a small 'NUM' indicator.

1. Select year
2. Enter event code (A, B, C, D, etc.)
3. Enter two letter island code (SB, AN, SC, SR, SM)
4. Enter transect number (Note: Anacapa Island transects have an alphanumeric code -1E, 2E,...1M, 2M,...1W, 2W,...etc. All the other islands have simple numeric codes)
5. Click the "Add 100 Points" button to populate the form with the correct number of data points.
6. Scroll through the data using the arrows at the bottom of each sub-form.
7. Collected tree and shrub data are also entered into this form.
8. To open up the shrub data sub-form click on the "Open Shrub Form" button.



## LandVeg Tables

To access this section of the database select Tables under the Objects list and then select Landveg under the Groups subsection. All of these tables are also listed in the general tables section. However that section is also populated with tables for the Plant Sightings database as well as other project specific tables.

Open up a particular table by double clicking on it. You won't be able to limit or change the information shown as most of the tables in the tables section are linked to other tables and can't be modified in the design view.

Screen print of the landveg group of tables in the LandVeg database.

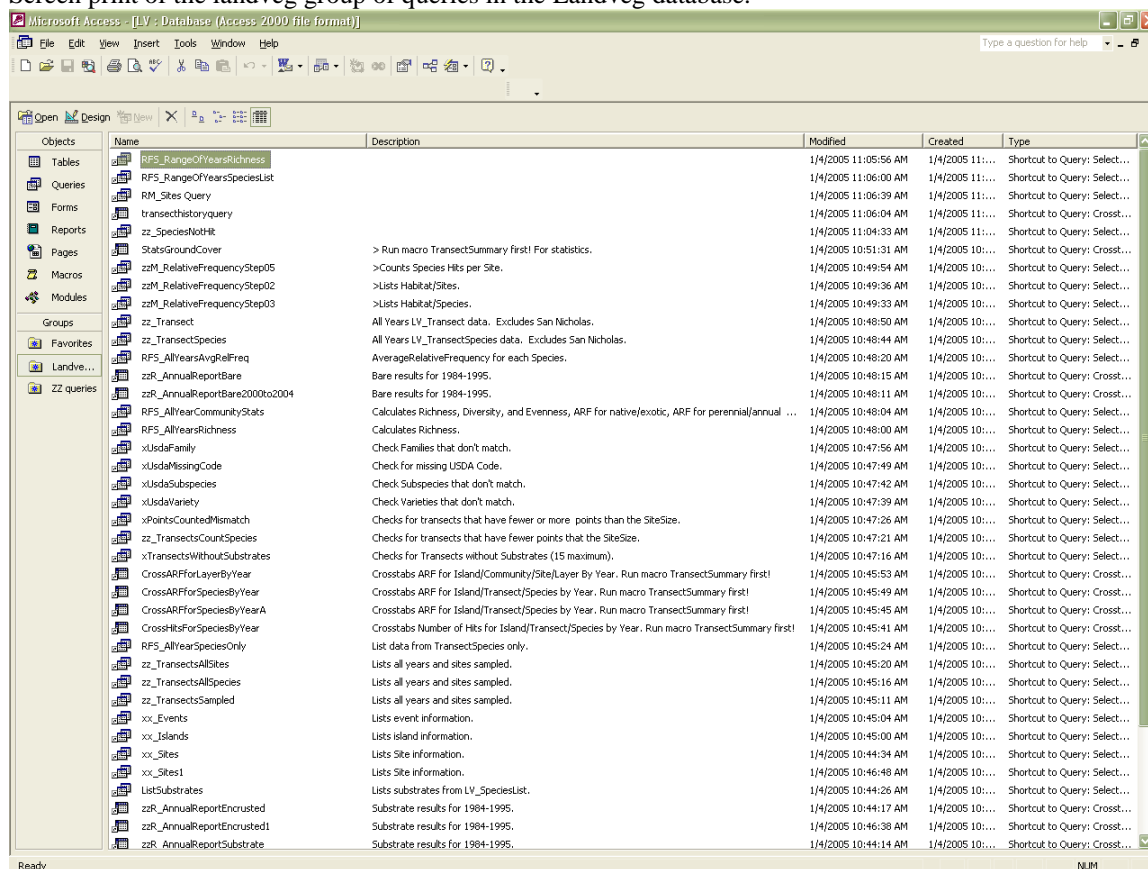
Objects	Name	Description	Modified	Created	Type
Tables	RFS_RangeOfYearsRichness		1/4/2005 11:05:56 AM	1/4/2005 11:...	Shortcut to Query: Select...
	RFS_RangeOfYearsSpeciesList		1/4/2005 11:06:00 AM	1/4/2005 11:...	Shortcut to Query: Select...
Queries	RM_Sites Query		1/4/2005 11:06:39 AM	1/4/2005 11:...	Shortcut to Query: Select...
Forms	transecthistoryquery		1/4/2005 11:06:04 AM	1/4/2005 11:...	Shortcut to Query: Crosst...
Reports	zz_SpeciesNothit		1/4/2005 11:04:33 AM	1/4/2005 11:...	Shortcut to Query: Select...
Pages	StatsGroundCover	> Run macro TransectSummary first! For statistics.	1/4/2005 10:51:31 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
Macros	zzM_RelativeFrequencyStep05	>Counts Species Hits per Site.	1/4/2005 10:49:54 AM	1/4/2005 10:...	Shortcut to Query: Select...
Modules	zzM_RelativeFrequencyStep02	>Lists Habitat/Sites.	1/4/2005 10:49:36 AM	1/4/2005 10:...	Shortcut to Query: Select...
	zzM_RelativeFrequencyStep03	>Lists Habitat/Species.	1/4/2005 10:49:33 AM	1/4/2005 10:...	Shortcut to Query: Select...
Groups	zz_Transect	All Years LV_Transect data. Excludes San Nicholas.	1/4/2005 10:48:50 AM	1/4/2005 10:...	Shortcut to Query: Select...
Favorites	zz_TransectSpecies	All Years LV_TransectSpecies data. Excludes San Nicholas.	1/4/2005 10:48:44 AM	1/4/2005 10:...	Shortcut to Query: Select...
Landveg...	RFS_AllYearsAvgRelFreq	AverageRelativeFrequency for each Species.	1/4/2005 10:48:20 AM	1/4/2005 10:...	Shortcut to Query: Select...
ZZ queries	zzR_AnnualReportBare	Bare results for 1984-1995.	1/4/2005 10:48:15 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
	zzR_AnnualReportBare2000to2004	Bare results for 1984-1995.	1/4/2005 10:48:11 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
	RFS_AllYearCommunityStats	Calculates Richness, Diversity, and Evenness, ARF for native/exotic, ARF for perennial/annual ...	1/4/2005 10:48:04 AM	1/4/2005 10:...	Shortcut to Query: Select...
	RFS_AllYearsRichness	Calculates Richness.	1/4/2005 10:48:00 AM	1/4/2005 10:...	Shortcut to Query: Select...
	xUsdaFamily	Check Families that don't match.	1/4/2005 10:47:56 AM	1/4/2005 10:...	Shortcut to Query: Select...
	xUsdaMissingCode	Check for missing USDA Code.	1/4/2005 10:47:49 AM	1/4/2005 10:...	Shortcut to Query: Select...
	xUsdaSubspecies	Check Subspecies that don't match.	1/4/2005 10:47:42 AM	1/4/2005 10:...	Shortcut to Query: Select...
	xUsdaVariety	Check Varieties that don't match.	1/4/2005 10:47:39 AM	1/4/2005 10:...	Shortcut to Query: Select...
	xPointsCountedMismatch	Checks for transects that have fewer or more points than the SiteSize.	1/4/2005 10:47:28 AM	1/4/2005 10:...	Shortcut to Query: Select...
	zz_TransectsCountSpecies	Checks for transects that have fewer points that the SiteSize.	1/4/2005 10:47:21 AM	1/4/2005 10:...	Shortcut to Query: Select...
	xTransectsWithoutSubstrates	Checks for Transects without Substrates (15 maximum).	1/4/2005 10:47:16 AM	1/4/2005 10:...	Shortcut to Query: Select...
	CrossARFForLayerByYear	Crosstabs ARF for Island/Community/Site/Layer By Year. Run macro TransectSummary first!	1/4/2005 10:45:53 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
	CrossARFForSpeciesByYear	Crosstabs ARF for Island/Transect/Species by Year. Run macro TransectSummary first!	1/4/2005 10:45:49 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
	CrossARFForSpeciesByYearA	Crosstabs ARF for Island/Transect/Species by Year. Run macro TransectSummary first!	1/4/2005 10:45:45 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
	CrossHitsForSpeciesByYear	Crosstabs Number of Hits for Island/Transect/Species by Year. Run macro TransectSummary first!	1/4/2005 10:45:41 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
	RFS_AllYearSpeciesOnly	List data from TransectSpecies only.	1/4/2005 10:45:24 AM	1/4/2005 10:...	Shortcut to Query: Select...
	zz_TransectsAllSites	Lists all years and sites sampled.	1/4/2005 10:45:20 AM	1/4/2005 10:...	Shortcut to Query: Select...
	zz_TransectsAllSpecies	Lists all years and sites sampled.	1/4/2005 10:45:16 AM	1/4/2005 10:...	Shortcut to Query: Select...
	zz_TransectsSampled	Lists all years and sites sampled.	1/4/2005 10:45:11 AM	1/4/2005 10:...	Shortcut to Query: Select...
	xx_Events	Lists event information.	1/4/2005 10:45:04 AM	1/4/2005 10:...	Shortcut to Query: Select...
	xx_Islands	Lists island information.	1/4/2005 10:45:00 AM	1/4/2005 10:...	Shortcut to Query: Select...
	xx_Sites	Lists Site information.	1/4/2005 10:44:34 AM	1/4/2005 10:...	Shortcut to Query: Select...
	xx_Sites1	Lists Site information.	1/4/2005 10:46:48 AM	1/4/2005 10:...	Shortcut to Query: Select...
	ListSubstrates	Lists Substrates from LV_SpeciesList.	1/4/2005 10:44:26 AM	1/4/2005 10:...	Shortcut to Query: Select...
	zzR_AnnualReportEncrusted	Substrate results for 1984-1995.	1/4/2005 10:44:17 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
	zzR_AnnualReportEncrusted1	Substrate results for 1984-1995.	1/4/2005 10:46:38 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
	zzR_AnnualReportSubstrate	Substrate results for 1984-1995.	1/4/2005 10:44:14 AM	1/4/2005 10:...	Shortcut to Query: Crosst...

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## Queries

To access this section of the database select Queries under the Objects list and then select Landveg under the Groups subsection. All of these Queries are also listed in the general queries section. However that section is also populated with queries for the Plant Sightings database as well as other project specific queries.

Screen print of the landveg group of queries in the Landveg database.



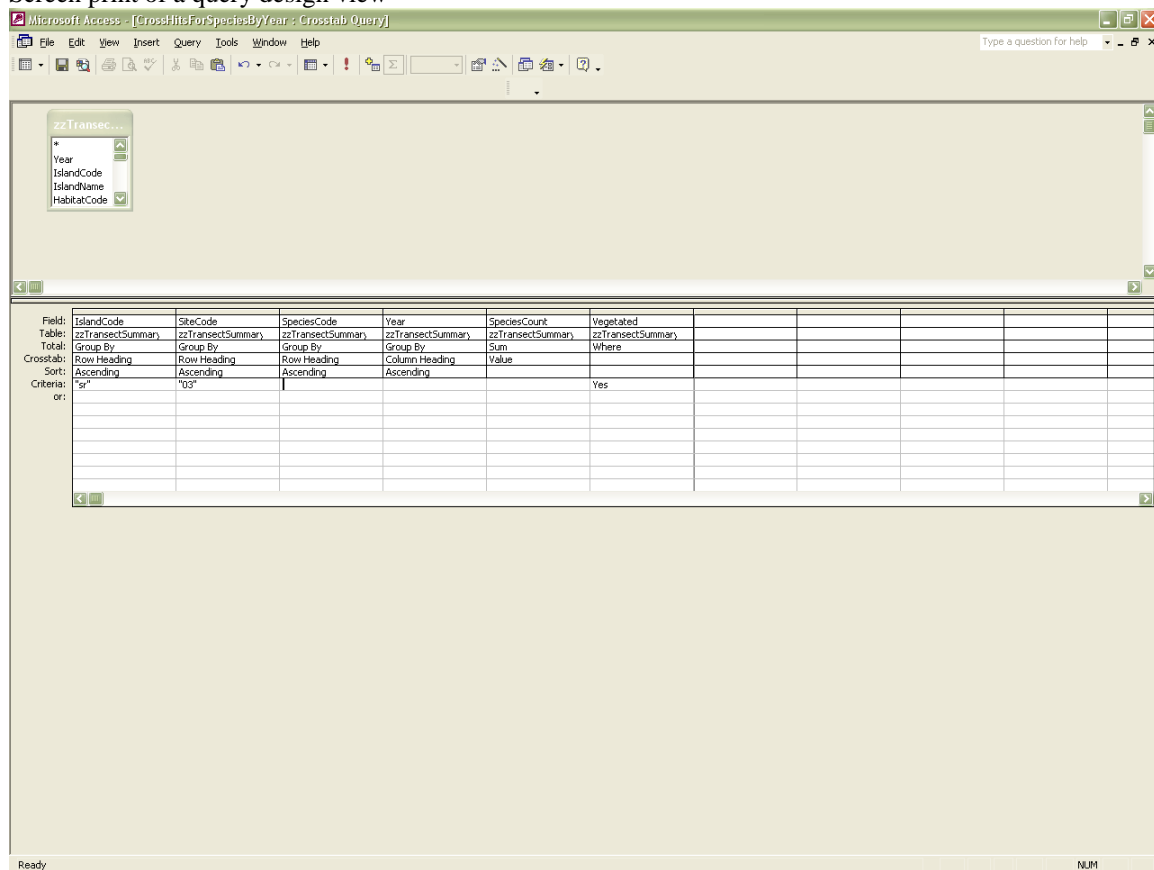
The screenshot shows the Microsoft Access interface for a database named 'LV - Database (Access 2000 file format)'. The 'Queries' group is selected in the left-hand navigation pane. The main window displays a list of queries with columns: Name, Description, Modified, Created, and Type. The queries are listed in alphabetical order by name.

Name	Description	Modified	Created	Type
RFS_RangeOfYearsRichness		1/4/2005 11:05:56 AM	1/4/2005 11:...	Shortcut to Query: Select...
RFS_RangeOfYearsSpeciesList		1/4/2005 11:06:00 AM	1/4/2005 11:...	Shortcut to Query: Select...
RM_Sites Query		1/4/2005 11:06:39 AM	1/4/2005 11:...	Shortcut to Query: Select...
transecthistoryquery		1/4/2005 11:06:04 AM	1/4/2005 11:...	Shortcut to Query: Crosst...
zz_SpeciesNotHit		1/4/2005 11:04:33 AM	1/4/2005 11:...	Shortcut to Query: Select...
StatsGroundCover	> Run macro TransectSummary first! For statistics.	1/4/2005 10:51:31 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
zzM_RelativeFrequencyStep05	>Counts Species Hits per Site.	1/4/2005 10:49:54 AM	1/4/2005 10:...	Shortcut to Query: Select...
zzM_RelativeFrequencyStep02	>Lists Habitat/Sites.	1/4/2005 10:49:36 AM	1/4/2005 10:...	Shortcut to Query: Select...
zzM_RelativeFrequencyStep03	>Lists Habitat/Species.	1/4/2005 10:49:33 AM	1/4/2005 10:...	Shortcut to Query: Select...
zz_Transect	All Years LV_Transect data. Excludes San Nicholas.	1/4/2005 10:48:50 AM	1/4/2005 10:...	Shortcut to Query: Select...
zz_TransectSpecies	All Years LV_TransectSpecies data. Excludes San Nicholas.	1/4/2005 10:48:44 AM	1/4/2005 10:...	Shortcut to Query: Select...
RFS_AllYearsAvgRelFreq	AverageRelativeFrequency for each Species.	1/4/2005 10:48:20 AM	1/4/2005 10:...	Shortcut to Query: Select...
zzR_AnnualReportBare	Bare results for 1984-1995.	1/4/2005 10:48:15 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
zzR_AnnualReportBare2000to2004	Bare results for 1984-1995.	1/4/2005 10:48:11 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
RFS_AllYearCommunityStats	Calculates Richness, Diversity, and Evenness, ARF for native/exotic, ARF for perennial/annual ...	1/4/2005 10:48:04 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
RFS_AllYearsRichness	Calculates Richness.	1/4/2005 10:48:00 AM	1/4/2005 10:...	Shortcut to Query: Select...
xUsdaFamily	Check Families that don't match.	1/4/2005 10:47:56 AM	1/4/2005 10:...	Shortcut to Query: Select...
xUsdaMissingCode	Check for missing USDA Code.	1/4/2005 10:47:49 AM	1/4/2005 10:...	Shortcut to Query: Select...
xUsdaSubspecies	Check Subspecies that don't match.	1/4/2005 10:47:42 AM	1/4/2005 10:...	Shortcut to Query: Select...
xUsdaVariety	Check Varieties that don't match.	1/4/2005 10:47:39 AM	1/4/2005 10:...	Shortcut to Query: Select...
xPointsCountedMismatch	Checks for transects that have fewer or more points than the SiteSize.	1/4/2005 10:47:26 AM	1/4/2005 10:...	Shortcut to Query: Select...
zz_TransectsCountSpecies	Checks for transects that have fewer points than the SiteSize.	1/4/2005 10:47:21 AM	1/4/2005 10:...	Shortcut to Query: Select...
xTransectsWithoutSubstrates	Checks for Transects without Substrates (15 maximum).	1/4/2005 10:47:16 AM	1/4/2005 10:...	Shortcut to Query: Select...
CrossARFForLayerByYear	Crosstabs ARF for Island/Community/Site/Layer By Year. Run macro TransectSummary first!	1/4/2005 10:45:53 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
CrossARFForSpeciesByYear	Crosstabs ARF for Island/Transect/Species by Year. Run macro TransectSummary first!	1/4/2005 10:45:49 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
CrossARFForSpeciesByYearA	Crosstabs ARF for Island/Transect/Species by Year. Run macro TransectSummary first!	1/4/2005 10:45:45 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
CrossHitsForSpeciesByYear	Crosstabs Number of Hits for Island/Transect/Species by Year. Run macro TransectSummary first!	1/4/2005 10:45:41 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
RFS_AllYearSpeciesOnly	List data from TransectSpecies only.	1/4/2005 10:45:24 AM	1/4/2005 10:...	Shortcut to Query: Select...
zz_TransectsAllSites	Lists all years and sites sampled.	1/4/2005 10:45:20 AM	1/4/2005 10:...	Shortcut to Query: Select...
zz_TransectsAllSpecies	Lists all years and sites sampled.	1/4/2005 10:45:16 AM	1/4/2005 10:...	Shortcut to Query: Select...
zz_TransectsSampled	Lists all years and sites sampled.	1/4/2005 10:45:11 AM	1/4/2005 10:...	Shortcut to Query: Select...
xx_Events	Lists event information.	1/4/2005 10:45:04 AM	1/4/2005 10:...	Shortcut to Query: Select...
xx_Islands	Lists island information.	1/4/2005 10:45:00 AM	1/4/2005 10:...	Shortcut to Query: Select...
xx_Sites	Lists Site information.	1/4/2005 10:44:34 AM	1/4/2005 10:...	Shortcut to Query: Select...
xx_Sites1	Lists Site information.	1/4/2005 10:46:48 AM	1/4/2005 10:...	Shortcut to Query: Select...
ListSubstrates	Lists substrates from LV_SpeciesList.	1/4/2005 10:44:26 AM	1/4/2005 10:...	Shortcut to Query: Select...
zzR_AnnualReportEncrusted	Substrate results for 1984-1995.	1/4/2005 10:44:17 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
zzR_AnnualReportEncrusted1	Substrate results for 1984-1995.	1/4/2005 10:46:38 AM	1/4/2005 10:...	Shortcut to Query: Crosst...
zzR_AnnualReportSubstrate	Substrate results for 1984-1995.	1/4/2005 10:44:14 AM	1/4/2005 10:...	Shortcut to Query: Crosst...

## Query table design view

Open up a particular query by double clicking on it. To refine the amount of data shown prior to opening the query, click once on the query of interest and then click on the design button above the Objects list. Type in the criteria of interest under the appropriate field heading. For example, to limit that data shown to one island, in the criteria section under the field heading of island type in SR and hit enter. When you open up the query in the table view only data collected for Santa Rosa Island will be displayed. To further limit the data shown to one or more transects, type in the transect number in the criteria section under the Sitecode field heading. To limit the query to a particular year, type in the year of interest in the criteria section of the year column.

### Screen print of a query design view

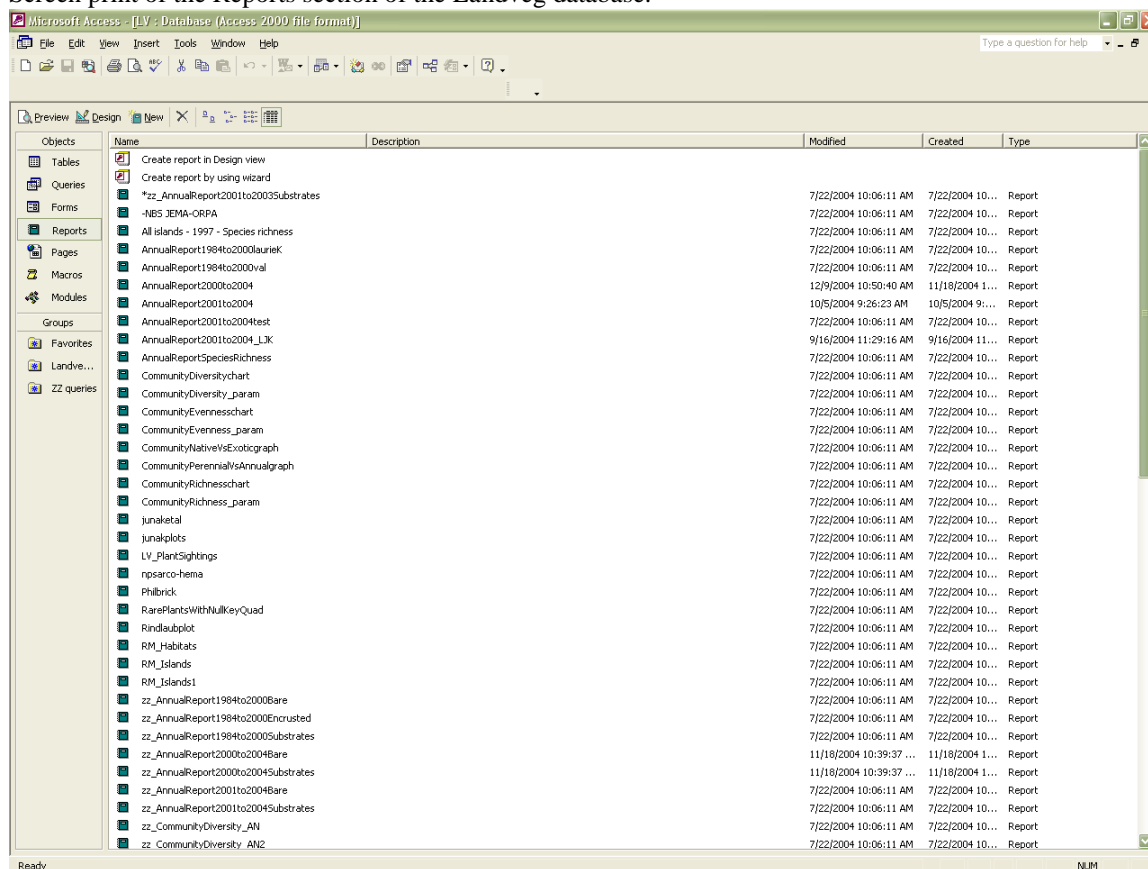


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## Reports Section

Presentation of the vegetation data in an appropriate form for the annual report is generated in this section. Pre-designed charts presenting community diversity, community richness, and community evenness are generated in this section as well.

Screen print of the Reports section of the Landveg database.



## Appendix C: Sample field data sheets

### Electronic Field Form

LV Data Form # 1

Photo #s: none

Island: SRI

Date: 10 May 2003

Transect #: 46

Spp. ID by: D. Rodriguez

Data Recorded by: J. Johnstone

Comments: Additional spp. within 1 meter: MEIN, DAPU

L (cm)	Point #	Substrate	Lowest				Highest		Max Ht.
			Sp 1	Sp 2	Sp 3	Sp 4	Sp 5	Sp 6	
30	1	litt	brdi						14
60	2	litt	ceme	brdi					20
90	3	litt	ceme	isme	brdi				21
120	4	litt	isme	brdi					20
150	5	litt	brdi	ceme					35
180	6	litt	brdi						20
210	7	litt	hobr	brdi					16
240	8	litt	isme	brdi					25
270	9	litt	brdi	isme	hobr				21
300	10	litt	mepo	jume	brdi	hobr			25
330	11	litt	mepo	brdi					25
360	12	litt	brdi						2
390	13	litt	brdi	avba					20
420	14	litt	brdi						24
450	15	litt	brdi						5
480	16	litt	brdi						22
510	17	litt	brdi						30
540	18	litt	brdi						20
570	19	litt	brdi						30
600	20	litt	brdi						20
630	21	litt	brdi						5
660	22	litt	brdi						2
690	23	litt	brdi	jume					14
720	24	litt	brdi	ceme	avba	jume			31
750	25	litt	jume	brdi					6
780	26	litt	brdi	ceme	hobr				7

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810	27	litt	brdi	hobr	jume	avba	5
840	28	litt	xxxx				0
870	29	litt	brdi				1
900	30	litt	brdi				15
930	31	litt	mepo	brdi	avba		45
960	32	litt	brdi				16
990	33	litt	brdi				5
1020	34	litt	mepo	brdi			20
1050	35	litt	brdi				26
1080	36	litt	brdi				22
1110	37	litt	brdi	mepo			6
1140	38	litt	mepo	brdi			15
1170	39	litt	brdi				20
1200	40	litt	brdi				20
1230	41	litt	ceme	brdi			20
1260	42	litt	brdi	avba			35
1290	43	litt	brdi	avba			40
1320	44	litt	brdi				17
1350	45	litt	ceme	brdi			15
1380	46	litt	brdi	avba			29
1410	47	litt	ceme	avba			10
1440	48	litt	ceme	avba			24
1470	49	litt	brdi	avba			40
1500	50	litt	avba				25
1530	51	litt	ceme	brdi	avba		36
1560	52	litt	avba	brdi			21
1590	53	litt	brdi				16
1620	54	litt	sima	brdi	avba		25
1650	55	litt	brdi	napu			17
1680	56	litt	napu	avba			36
1710	57	litt	mepo				5
1740	58	litt	ceme	brdi			11
1770	59	litt	brdi	avba			55
1800	60	litt	brdi	avba			40
1830	61	litt	ceme	avba			30
1860	62	litt	ceme	hobr	avba		30
1890	63	litt	avba				31
1920	64	litt	avba				40
1950	65	litt	brdi	avba			45
1980	66	litt	avba				25
2010	67	litt	avba				25
2040	68	litt	brdi	avba			35
2070	69	litt	avba				30
2100	70	litt	brdi	avba			37
2130	71	litt	ceme	brdi			20
2160	72	litt	brdi	avba			35

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2190	73	litt	brdi	avba	40
2220	74	litt	brdi		17
2250	75	litt	ceme	brdi	15
2280	76	litt	brdi	avba	29
2310	77	litt	ceme	avba	10
2340	78	litt	ceme	avba	24
2370	79	litt	brdi	avba	40
2400	80	litt	avba		25
2430	81	soil	xxxx		0
2460	82	litt	sool	brho brdi	11
2520	84	litt	mepo	brdi	10
2550	85	litt	brdi		10
2580	86	litt	brdi	avba	35
2610	87	litt	brdi		2
2640	88	soil	xxxx		0
2670	89	litt	brdi		17
2700	90	litt	xxxx		0
2730	91	litt	ceme	brdi avba	36
2760	92	litt	avba	brdi	21
2790	93	litt	brdi		16
2820	94	litt	sima	brdi avba	25
2850	95	litt	brdi	napu	17
2880	96	litt	napu	avba	36
2910	97	litt	mepo		5
2940	98	litt	ceme	brdi	11
2970	99	litt	brdi	avba	55
3000	100	litt	brdi	avba	40

## Appendix D: Vegetation Transect Site Descriptions

This appendix contains specific information on each monitoring transect including site descriptions, common species recorded at each site, and detailed maps for finding the marker stakes at each site. An island-wide map precedes the transect site descriptions for each island to provide general locations.